

TDS Intelligent Dry Sorting Machine

Based on X-Ray Identification

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SUMMARY

Different from the traditional gravity coal processing methodology, the TDS Intelligent Dry sorting machine (TDS) is based on intelligent recognition technology. This article demonstrates the principles of operation, advantages and possible applications within the coal industry. TDS is suitable for a 300-25mm particle size, is a simple system, with low production and investment costs.

1.0- INTRODUCTION

The predominant method of coal processing for this size fraction is Dense Medium Separation which requires water, consumables such as magnetite and flocculants. It can be a relatively complicated process with associated higher production costs. With the development of 'big data' technology, the accuracy of TDS, which was developed by Tianjin Meiteng Co., Ltd. (Meiting), has made a quantitative advancement in this technology to meet the requirements of the coal industry.

2.0-TDS Operating Principles.

By responding to the different coal characteristics, TDS uses the intelligent recognition method to build an online adaptable analysis model. Through 'big data' analysis, the digital signals of the specific coal and discard particles are identified, and the discards discharge through the waste discharge system. TDS system includes the feeding, recognition and coal/discard ejection as major systems, dust control, power distribution and the overall control system as its auxiliary systems.

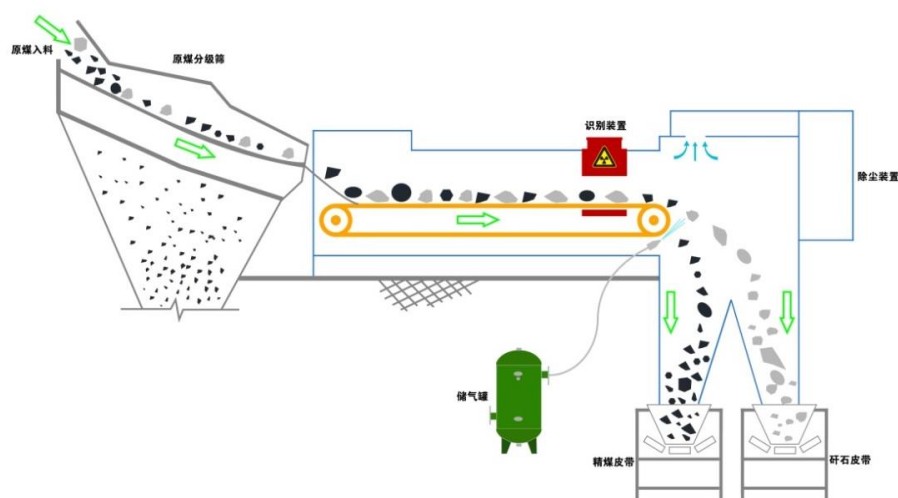


Figure 1: TDS schematic diagram

3.0-TDS Typical Plant Results

3.1 Sorting Accuracy

Typical coal misplaced to discards is 1-3%, discards misplaced to coal is 3-5%. The analysis of results from 3 coal preparation plants have been shown in Table 1.

Project	Size mm	Raw coal fed Ad, %	Clean coal Ad, %	Discard ash %	Coal in rejects %
Zhao Zhuang Coal Mine	300-80	48.50	13.40	35.10	0.85
Ping Shang	100-25	43.87	13.10	30.77	2.72
Hua Shengrong Coal Mine	300-50	47.09	12.52	34.57	0.96

Table 1: Analysis of typical results from operating facilities.

3.2. Processing feed Size

The unit can accept a variable size range from 300-25mm. If the unit adopts the 'coal ejection' mode, the maximum feed size can be increased up to 1000mm.

3.3. Processing capacity

Maximum processing capacity for a machine treating 300-50mm can be up to 380t/h. If coal quality permits and the -50mm can be bypassed direct to product, this gives the opportunity to maximize tonnage, overall plant yield and minimize capital and operational costs.

3.4. Reliability

TDS has already been in operation for more than a year on some mines, operating for typically 60 hours without any breakdowns or maintenance interventions. Typical operating requirement per year is 5700 DOH.

4.0-TDS Benefits

4.1. Lower investment cost, short construction period

With no water requirements, and a very small footprint, these units are ideal for;

- Dump reclamation project.
- Situation where the finer material (where the quality is suitable) can bypass the TDS plant without further processing.
- An 'in pit' primary clean-up of raw coal.

4.2. Low production cost

- Minimum labour requirement, as the TDS unit runs unattended.
- Low spares holding compared to a conventional plant.
- Lower power consumption.

5.0.-TDS Application.

TDS typical process

- 300-50mm lump coal pre-reject process, TDS clean coal can be fed directly into a cyclone to produce a primary and secondary product.
- 300-25mm lump coal sorting process, TDS clean coal will be taken direct as product.

TDS technology has been implemented and matured at the following sites. Zhaozhuang Coal Mine, Pingshang Coal Mine and HuaShengrong Coal Mine.

5.1.-Application at Zhaozhuang Coal Mine.

- Utilizing the TDS instead of manual picking to sort +100mm raw coal.
- TDS clean coal is fed into dense medium cyclones.
- One TDS18-300 Type (Conveyor width 1800mm), processing capacity: 150t/h
- TDS was installed after removing manual picking conveyor, details shown as Diagram 2

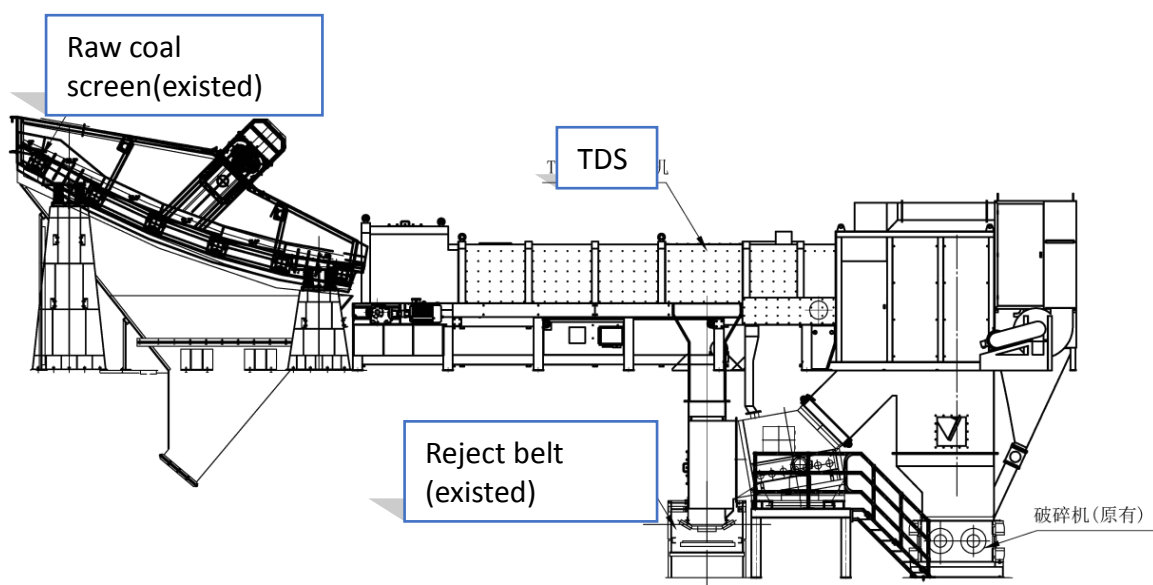


Diagram 2: TDS Setting in Zhaozhuang Coal Mine In production since June 19th, 2016.

TDS efficiencies were carried out during production. The Coal Supply Agreement (CSA) requires coal misplacement to discards to be less than 3.5%. Typically, the coal misplacement is less than 0.85%. Results can be seen on Figure 3 1st Nov 2016 TDS Efficiency Test.

TDS has already been in operation for more than a year at Zhaozhuang plant.

检测报告

表 4-1 检测数据表

检测日期: 2016 年 11 月 01 日

检测序号	采样时间 时:分:秒	检测数据			检测结论
		筛上煤重量 kg	筛下石重 kg	筛石中 带煤率 %	
第一次	12:00-13:00	108	23000	0.82	符合合同要求
第二次	13:30-14:30	105	21500	0.91	符合合同要求
第三次	15:00-16:00	105	19800	0.83	符合合同要求
合计		318	64300	0.85	符合合同要求
检测单位	晋煤集团赵庄选煤厂				天津英腾科技有限公司
检测人员	李德军 李德军 李德军				

5. 检测结论

第一次检测 TDS 智能干选机分选后的落地矸石中带煤率为 0.82 %, 第二次检测 TDS 智能干选机分选后的落地矸石中带煤率为 0.91 %, 第三次检测 TDS 智能干选机分选后的落地矸石中带煤率为 0.83 %, 三次检测平均矸石中带煤率为 0.85 %, 符合合同要求。

晋煤集团赵庄选煤厂
2016 年 11 月 01 日

2

Figure 3: 1st November 2016 TDS Efficiency Testing

1) Operating benefits to Zhaozhuang

- Lower feed ash in dense medium system

With the TDS rejecting the +100mm material, a 2% decrease in feed ash to the dense medium plant has been realized.

- Reduce abrasive load from crusher

After removing the abrasive +100mm material from the system, the crusher amperage reduced from 60-80A to 30-45A, (shown as Table 2). Power and maintenance costs have decreased significantly.

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Time	Crusher Current (Amps)	
	TDS system 210 crusher	Manual picking system 209 crusher
23.30	35	68.4
23.35	37	68.8
23.40	39	65.2
23.45	37	65.2
23.50	39	68.4
23.55	40	65.2
0.00	37	65.2
0.05	37	66.3
0.10	35	74.2
0.15	34	64.4
0.20	38	68.4
0.25	43	65.2
0.30	37	65.2

Table 2: Comparison of TDS system crusher and manual picking system crusher.

5.2 Application in Pingshang plant

- TDS processes the 100-25mm raw coal for direct sale.
- One TDS with type of TDS18-100 (Conveyor width 1800mm), processing capacity is 100t/h.
- TDS system flowsheet is shown in Figure 4
- In operation since February 16th, 2017

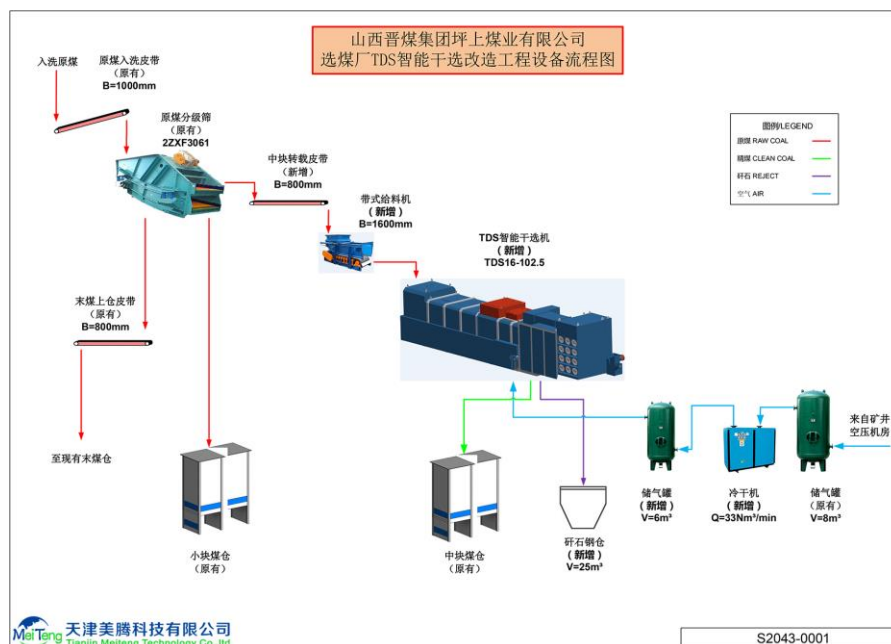


Figure 4: TDS system flow sheet at Pingshang.

Coal misplaced to discards is 1-3%.

Ash percentage in raw coal is 20-40%; ash percentage in clean coal is 14%, which fulfills the requirements of the CSA.

Because of the success of TDS at Zhaozhuang and Pingshang, the technology for sorting 300-25mm lump coal has been recognized throughout China, and more coal mine operations are adopting this very flexible technology, Table 3.

No.	Project	Width of Conveyor	Capacity	Size	TDS fine coal use	Production date
1	Hua Shengrong Coal Mine	1800mm	160	300-50	Direct for sale	Aug-16
2	Zhaoxian mine Coal Mine	1800mm	160	300-50	Require subsequent process	End of 2017
3	Ganhe Coal Mine	2000mm	180	300-50	Require subsequent process	Nov-17
4	Yongdingzhuang Coal	2000mm	200	300-50	Direct for sale	End of 2017
5	Siheerhaojing Coal	3200mm	180	80-25	Direct for sale	End of 2018

Table 3: TDS Future Installations.

6.0. Conclusion

TDS works by X-Ray Identification but has improved the technology by utilizing an intelligent 'online' recognition system to analyse the digital signals between coal and discard. The analysis model is continually updating ('big data analyses'), and results in an efficient separation process which has a number of benefits.

TDS is already operational on 3 coal mines and in construction on another 4.

The TDS technology has matured and is a widely accepted technology in China.

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